ORIGINAL RESEARCH—INTERSEX AND GENDER IDENTITY DISORDERS

Gender Reassignment Surgery in Male-to-Female Transsexualism: A Retrospective 3-Month Follow-up Study with Anatomical Remarks

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ABSTRACT

Introduction. Greater acceptance of sexual minorities has enabled people with transsexualism access to adequate treatment and social integration. Gender reassignment surgery is a complex phase in the care of transsexual patients. In response to a greater volume of patients, surgical techniques have evolved and the outcome in patients with male-to-female transsexualism is now a very accurate imitation of female genitalia, enabling sexual intercourse with orgasm.

Aim. To evaluate the results of surgical reassignment of genitalia in male-to-female transsexuals.

Methods. A retrospective 3-month follow-up study of patients' opinions following gender reassignment surgery in 129 patients having a primary procedure (eight of whom had later sigmoideocolpoplasty) and five patients undergoing reoperation following an initial unsuccessful procedure at other units. All patients were male transsexuals. The surgical techniques are described in detail.

Main Outcome Measures. Sexual functions and complications 3 months after surgery.

Results. All patients were satisfied with the first phase operation. Thirteen patients (9.7%) underwent successful sigmoideocolpoplasty. Main complications were as follows: rectal lesions developing during preparation of the vaginal canal (1.5%); bleeding from the stump of the shortened urethra in the first 48 hours postoperatively requiring secondary suturing (4.5%); temporary urinary retention requiring repeated insertion of urinary catheters for up to 6 days (5.2%); and healing of the suture between the perineum and the posterior aspect of the vaginal introitus healing by secondary intention (5.2%). The neoclitoris had erogenous sensitivity in 93.9% of patients and 65.3% reached orgasm in the first 3 months.

Conclusions. Surgical conversion of the genitalia is a safe and important phase of the treatment of male-to-female transsexuals. **Jarolím L, Šedý J, Schmidt M, Naňka O, Foltán R, and Kawaciuk I. Gender reassignment surgery in male-to-female transsexualism: A retrospective 3-month follow-up study with anatomical remarks. J Sex Med 2009;6:1635–1644.**

Key Words. Male-To-Female Transsexualism; Sex Reassignment Surgery; Anatomy

Introduction

Transsexualism is a sexual identification disorder. Patients have genetic, somatic, and hormonal characteristics of one sex, but their sexual identification is with the opposite sex. Gender identity refers to subjectively felt agonism or antagonism with one's own body, with its primary and secondary signs of gender, and the social roles attributed by particular social and cultural environments to that gender. Transsexual people permanently feel they are a person of the opposite gender to the one they were born as, and they express the desire to act as a person of opposite gender.

Transsexualism was first described in detail by Dr. H. Benjamin in 1953 [1]. In 1978, he founded an international organization which originally bore his name—the Harry Benjamin International Gender Dysphoria Association, now known as the World Professional Association for Transgender Health—which has played an important role in expanding knowledge about transsexualism [2]. It developed a protocol for treating transsexual patients, which delineates time periods for particular diagnostic and treatment steps to differentiate transsexualism from other disorders. Mistakes in diagnosis and inappropriate gender reassignment can lead to irreversible damage, so it is important to exclude homosexuality, psychosis, psychopathy, organic brain lesions, and transvestitism.

Following appropriate diagnosis, psychotherapeutic preparation for gender reassignment is started. Before surgery, male patients spend 12 months living as a female and undergo at least 6 months of continuous hormonal treatment [3,4], during which time they are monitored to see whether they are adapting to their new social roles. Surgery, however, remains the cardinal treatment point. It is appropriate for people who suffer long-term discomfort created by their unacceptable gender, such as a fear of developing sexual signs and reaching adolescence. The decision to undergo surgery should be made in conjunction with a sexual therapist following long-term psychological observation. In our unit, the final decision is made by a specialized panel, at least two members of which must be specialists in sexual therapy, one in psychiatry, and one in gynecology or urology, assisted by a clinical psychologist and a lawyer. The panel is organized by the hospital where the surgery will be performed. Following surgery and legalization of the gender reassignment, long-term sexual and physical rehabilitation is necessary to maintain and improve the function of the new genitals.

Epidemiological studies on transsexualism have produced differing data. De Cuypere found the prevalence of male transsexualism in Belgium to be 1:12,900 [5]; Kuhn's figure was three times lower, at 2.4:100,000 people [6]. In Sweden, the ratio of the incidence of male and female transsexualism changed from 1:1 in the 1960s to 2:1 in the 1990s [7]; in Serbia, the ratio is currently 1:1 [8]. Explanations for these discrepancies include differences in the readiness and ability of the medical profession to treat this disorder.

We examined patient satisfaction with male-to-female gender reassignment surgery over a 16-year period and describe the procedures used in detail.

Materials and Methods

Patients

One hundred thirty-four patients with male-to-female transsexualism were operated on from 1992 to 2008. Their mean age was 31.0 ± 0.8 years (range 18–54 years). Mean body mass index of patients was 23.2 ± 0.3 (range 17.8–33.9). All patients were white Caucasians. One patient has been contraindicated to surgery due to severe coagulopathy (not included in the sample). Patients did not have many important comorbidities (Table 1). Combined hormonal pretreatment, consisted of estrogene (estradiolum) and antiandrogene (cyproteron acetate), lasted for at least 9 months before surgery (mean duration 20.2 ± 1.5 months; range 9–123 months) and stopped 10–14 days before surgery to prevent tromboembolic complications. Moreover, low molecular weight heparin (enoxapatin 2 000 anti-Xa international units (IU)/day or nadroparin 2 850 anti-Xa IU/day) was administered for 5–7 days after the surgery. The surgery was divided in two phases. First, orchiectomy and penectomy, together with formation of the neovagina, vulva, and neoclitoris, were performed. The second phase focused on the configuration of the anterior vulval commissure

Table 1 The occurrence of important actual and previous comorbidities

Condition	No. of cases	% of all
Actual diseases		
Gilbert syndrome	3	2.2
Hepatitis C	2	1.5
Hepatitis B	1	0.7
Hypertension	1	0.7
Previous diseases		
Syphylis, second state	1	0.7
Deep venous trombosis	3	2.2

and, usually, the perineum. From the total of 134 patients, 129 patients underwent a primary procedure and five patients underwent reoperation following unsuccessful surgery performed at other units. Patients underwent preoperative preparation of the intestine because of the close relation of the surgical field to the rectum and anal canal.

Surgical Technique

The patient was placed in a lithotomy position. The operative field was prepared from the epigastrium to the thighs, including the genitalia and anus. A urinary catheter was inserted. The surgical approach began with an incision in the scrotal raphe from the base of the penis to the perineum and dorsally to a site 2 cm from the anus. This approach allowed for as short a perineum as possible, which is a prerequisite for natural topographical–anatomical relations and a regular course for the vagina, enabling sexual penetration. The dorsal pole of the incision was occasionally terminated in an inverted Y-shape, facilitating a tension-free anastomosis between the skin of the penis and the perineum.

Preparation of the Neovagina Space

The incision of the perineal center was deepened to form a tunnel between the rectum and the bladder, where the neovagina was subsequently inserted. After penetration through the subcutaneous fat, the central tendon of the pelvis, to which the fibers of superficial transverse muscle were inserted, was opened transversely and thus the space for a wide vaginal introitus was created. The rectourethral muscle was dissected to reach the external leaf of Denonvillier's fascia, and the medial fibers of levator ani were cut. Using a sponge and finger, blunt dissection of the vaginal canal between the base of the bladder and the rectum was performed. The balloon of the urinary catheter helped to identify the bottom of the bladder.

Bleeding from branches of the inferior rectal artery and vein was treated by ligature. The vaginal canal was temporally filled with gauze packing to prevent capillary surface bleeding. Preparation continued up to the inside aspect of the scrotum. The testes were isolated, together with fat and the spermatic cord. The spermatic cords were transected and ligated proximally, close to the external inguinal canal, using polyglycolic sutures. The stumps of the funicles spontaneously fell back into the inguinal canal and palpable painful nodules did not develop.

Penile Resection

In the dorsal part of the surgical field, bulbospongiosus was divided and resected together with ischiocavernosus. Arteries supplying ischiocavernosus, running on the crura penis close to the origin of ischiocavernosus, were diathermied or ligated. The bulbar urethra was separated from the corpora cavernosa up to the crural junction, near to where the bulbar vessels enter. The short artery of the bulb of the corpus spongiosum (1.7–2 cm long) was closed by ligature and placed beside the base of the bulb (it emerges from the trunk of the penile artery, piercing caudally the deep transverse perineal muscle and continuing mediocaudally between the crus and the bulb to enter the bulb from the dorsal aspect at positions 2 and 10 to supply the deep transverse perineal muscle and bulbourethral gland). It was not necessary to separately ligate the bulbar vein of the penis, which provides venous drainage of the bulb into the deep venous system via the prostatic plexus. Arterial bleeding from the borders of the corpus spongiosum stopped after urethral marsupialization. Quite massive urethral bulb was necessary to resect and quilt to not cause a barrier for penile insertion after erogenous stimulation. The bulbar urethra was shortened to 5 cm and prepared for the external opening. During the urethral resection, it was necessary to identify and bilaterally ligate the urethral (bulbourethral) arteries, which enter the corpus spongiosum together with the urethra and continue further, supplying the penile urethra, corpus spongiosum, and glans of the penis.

Neovagina Formation

The next step was to prepare the penile skin flap. This is supplied by the superficial penile arterial system, usually composed of only the external pudendal artery, divided in a ventrolateral and a dorsolateral branch. After separating the skin from the coronary sulcus, it was necessary to diathermy the free end of the main vein of the superficial venous system which drains the skin and subcutaneous tissue of the penis, including the preputium and the superficial dorsal vein of the penis. This is usually an unpaired vein running in the midline on the dorsum of the penis, between the superficial (Collesi) and deep (Bucki) fascia of the penis. The skin of the penis, together with subcutaneous fat, the superficial fascia of the penis, and the superficial veins, was meticulously separated from the deep fascia of the penis deep to the coronary sulcus by scissors and was subsequently cut away in a

circular manner. Dorsally, close to the corona of the glans, a 1 × 1-cm wide flap composed of the preputial internal layer was left, to avoid having hairy skin above the glans of the neoclitoris. The flap from the penile skin was used to construct the neovagina.

Neoclitoris Formation

After separating the penile skin, a neoclitoris was formed from the glans of the penis, together with the mobilized neurovascular bundle to maintain the sensitivity important for the sexual life of the patient [9,10]. The dorsal neurovascular bundle, composed of the laterally running dorsal nerve of the penis, the medially running dorsal artery of the penis, and the unpaired dorsal vein of the penis running in the midline, was dissected. Identification and meticulous mobilization of fibers of the dorsal nerve of penis—the most important and thickest sensory nerve, running inside the dorsal neurovascular bundle lateral to the vessels—was crucial.

Dissection of the neurovascular bundle began with two longitudinal incisions on the border of the tunica albuginea, transecting the deep fascia of the penis on positions 2 and 10, under the above-mentioned vessels and nerves. The lines of the incision diverged between the coronary sulcus to positions 3 and 9, respecting the fan-shaped branching of the vessels and nerves. Proximally, the incision ran in a parallel manner towards the fundiform ligament. The circumflex arteries emerging from the dorsal artery during its course on the dorsum of the penis, circling the penis, and supporting the blood supply of the corpus spongiosus were diathermied and cut together with the corresponding circumflex veins dorsally to the longitudinal incisions.

Preparing the dorsal neurovascular bundle was a very delicate procedure because the nerves, arteries, and veins had to be spared to maintain the blood and nerve supply of the neoclitoris (Figure 1). The dissection was made difficult by the presence of short inconstant emissary veins—anastomoses between the intermediate and deep venous system of the penis—piercing the tunica albuginea. During dissection of the dorsal neurovascular bundle, the very short vascular stumps had to be ligated by 4-0 or 5-0 suture ligatures or by bipolar diathermy to preserve the nerve fibers inside the bundle. Additionally, the dissection was complicated by the inconstant configuration of the dorsal groove between corpora cavernosa hosting the dorsal neurovascular bundle.

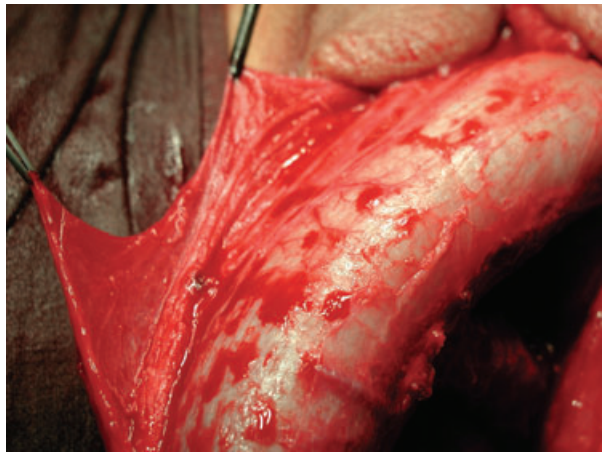

Figure 1 Dissection of the dorsal neurovascular bundle.

Proximally, preparation of the bundle continued below the suspensory ligament of the penis, where the bundle started to divaricate from the corpora cavernosa. Distally, preparation continued on the surface of corpora cavernosa beneath the glans of the penis, preferably to the dorsal border of urethra. Dissection continued medially under the dorsal arteries of the penis. The last branches of the penile artery (piercing the suspensory ligament of the penis and continuing on the dorsal aspect of the penis to the glans and prepuce) were spared medial to the branches of dorsal nerve. Distally, close to the coronary sulcus, the dorsal arteries were dissected in positions 3 and 9 because the final segment of the dorsal artery of penis curves laterally and both the right and left dorsal arteries join on the ventral surface of the penis as the unpaired frenular artery.

Finally, the usually unpaired deep dorsal vein of the penis, which is the main trunk of the intermediate venous system and runs in the middle of the dorsal neurovascular bundle following the dorsal arteries, was released. The delineated dorsal part of the glans was reduced to an 8 × 8-mm flap, which was used to form the neoclitoris (Figure 2).

Ablation of the corpora cavernosa respected the retrocrural course of the dorsal nerves of the penis, particularly during ligation of the crura of the corpora cavernosa with the deep artery and vein of the penis. The ventral part of the crura penis was resected, deep vessels were selectively treated, and the defect was closed by continuous sutures. The deep artery of the penis (crural artery, cavernous artery) enters the crura of corpora cavernosa 1.5–2 cm from the site of the emerging artery of the

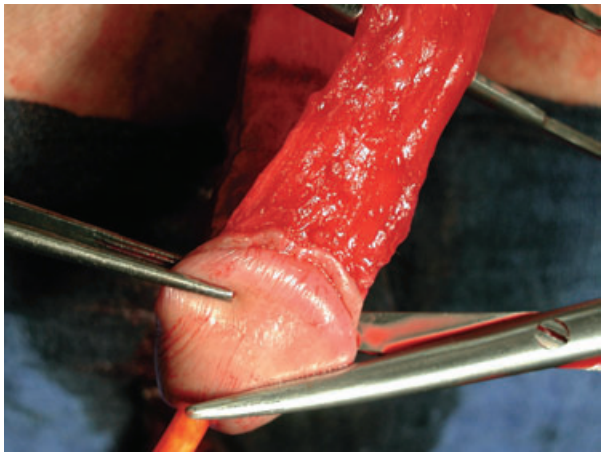

Figure 2 Reduction of the glans for neoclitoridoplasty.

bulb and runs inside the corpora cavernosa towards the glans; it was diathermied during transection of the crus of corpus cavernosus. The deep vein of the penis drains into the venous prostatic plexus that runs inside each corpus cavernosus: it was ligated when suturing the stumps of the crus of the corpora cavernosa.

During the operation, the dorsal nerve was jeopardized not only during its course in the dorsal neurovascular bundle but also during ligation of the stumps of the crura of the corpora cavernosa. The dorsal nerve emerges from the pudendal nerve and pierces the urogenital diaphragm in contact with the inferior pubic ligament; it was at risk because of its close relation to the inferior border and ventral surface of the body of the pubic bone, in the sulcus nervi dorsalis penis [11,12], close to the insertion of the crus of the corpora cavernosa where it runs between the crus and the ventral surface of the body of pubis to emerge on the dorsum of the penis. The running sutures of the crura, therefore, could not involve the tissue close to the bone. The lateral border of the sulcus is palpable on the ventral aspect of the pubic bone and thus was used as an anatomical landmark for the safe insertion of the needle [13,14].

The subcutaneous fat of the mons pubis and hypogastrium was undermined rostrally up to the umbilicus, but the branches of superficial external pudendal artery, superficial epigastric artery, and superficial circumflex iliac artery were spared as much as possible. We were able to gain 5–7 cm of skin to transpose from the dorsum of the penis caudally and dorsally. Approximation of the borders of the flap of the glans by one transverse suture caused a bulge on its surface and, thus, a typical neoclitoris appearance. The supplying neurovascular bundle was fixed by one suture to the connective tissue above the symphysis to prevent uncontrolled torsion or strangulation.

Primary Vulva Formation

A flap of penile skin was formed into a tube, closed at its distal end, and inserted into the formed vaginal canal in the pelvis. A vaginal mirror was inserted into the neovagina to stabilize it temporarily. The glans of the neoclitoris was sutured by 3-0 sutures inside a hole in the skin in a typical position. The end of the resected urethra was discised in a 2.50-cm length and sutured into a longitudinal hole in the skin located 1 cm below the glans of the neoclitoris. A running 3-0 suture was used to create good hemostasis of the edges of the corpus spongiosus. The urethra was marsupialized and longitudinally discised to reduce the risk of urethrocutaneous anastomosis stricture, produce a better cosmetic appearance of the vestibule, and enable urination when sitting without any problems.

Fixation of the skin flap of the neovagina was performed by inserting a 15-cm long and 4-cm thick modeling plastic cylinder (Figure 3). Redundant scrotal skin was resected, the labia majora were prepared, and the skin was closed by running locked 2-0 sutures. Dorsally, the space between the borders of the neovagina and the perineal skin was closed by interrupted 2-0 sutures.

A suction drain was inserted paravaginally and exteriorized through the left labium ventrally. The wound was covered by oleaginous gauze and a sterile compressive bandage, which fixed the plastic cylinder inside the neovagina (Figure 4). In the postoperative period, metronidazole, a sultamiciline, and low-molecular heparin were administered. The tamponading plastic cylinder was left in situ for 2–3 weeks. During extraction of the cylinder, it was necessary to instill lubricating gel inside the neovagina, to prevent eversion of its wall. Further autodilation of the neovagina was perfumed by the patient using a simple penile model. The urinary catheter was left in the bladder for the first 3–5 days [15].

Second Phase Vulvoplasty

The vascular supply of the neovagina courses in the anterior cutaneous pedicle of the flap. After the first phase operation, the labia majora diverge; however, this divergence can be modified during the second phase to preserve the vascular supply of the neovagina. The convergence of labia majora

Figure 3 Neovaginal stenting with a plastic cylinder.

Figure 5 Double Z-plastic approximating the labia majora on their ventral aspect.

was formed by double Z-plasty [16,17], during which the skin flaps are changed with the subcutaneous layer (Figure 5).

The glans of the neoclitoris was partially embedded by the double Z-plasty. Moreover, during the Z-plasty, the skin of the introitus was moderately folded, imitating labia minora. The neovagina, having been constructed from the inverted penile skin flap, had a thin and soft wall and required careful hygiene with neovaginal irrigation.

Sigmoideocolpoplasty

If the penile skin was not usable for the vaginoplasty or if a previous vaginoplasty was insufficient, the neovagina was created from an intestinal segment by sigmoideocolpoplasty [18]. The vaginal canal was prepared by the above-mentioned technique. During the reoperation, the dissection was more difficult because of the presence of scar tissue. A safe approach to the abdominal cavity was obtained by the cosmetically acceptable Pfannenstiel incision. On the bottom of the space of Douglas, the perineum was incised and, by sharp dissection against a sponge held in forceps, inserted inside the vaginal canal. The canal was connected with the abdominal cavity.

A 15-cm long rectosigmoid segment, supplied from the inferior mesenteric and inferior rectal arteries, was resected (Figure 6). The innervation of the graft by autonomic nerves brought the ability to feel vibration and at least some pleasant sensations. Intestinal continuity was restored by entero-enteroanastomosis with a running polyglyconic suture, and the opening in the mesosigmoid was closed. The resected segment of rectosigmoid

Figure 4 Fixation of the tube to the neovagina by compressive bandage.

Figure 6 Excluded segment of intestine for the sigmoid neovagina.

was closed at its proximal end and the distal end opened onto the vestibulum. To prevent a scar and stenosis, the diameter of the anastomosis between the intestinal end and the skin was enlarged by longitudinal incisions of the intestine.

Evaluation of the Operation

Evaluation of the results focused on the postoperative course up to 3 months after the first phase of the operation because the majority of patients did not need further urological care and were not seen again after this period. Data on the erogenous function of the neoclitoris and the ability to reach orgasm were obtained only in patients who were examined before the second phase operation, commissuroplasty; we were not able to follow up the rest of patients. Patients were questioned on sexual functions, i.e. erotogenic sensitivity (present/not present) and ability to obtain an orgasm (yes/no) at 3 months after the first phase surgery. The data about the follow-up of patients after the second phase surgery were not available—different specialists in sexology continued to care for the patients.

Statistical Analysis

The age values, body mass index values, and duration of hormonal therapy are reported as mean ± standard error of the mean. Percentage occurrence of complications and comorbidities were calculated from all 134 patients included into the study.

Results

Of the 129 patients undergoing a primary procedure, penectomy was performed in 128 cases, bilateral orchiectomy in 127 patients, and unilateral orchiectomy (due to the presence of a solitary testis) in one case. In 128 patients, a neovagina was formed from the inverted skin of the penis. Together, 40 complications were present in 21 patients; all of them were resolved (Table 2). The lesions obtained by perioperative rectal damage during preparation of the vaginal canal were sutured in two layers and they healed by primary intention. Bleeding from the stump of the shortened urethra in the first 48 hours after the operation required secondary suturing to the border of the spongious urethra. Temporary urinary retention required repeated insertion of a urinary catheter during the first 1–6 days postoperatively. In seven patients, the suture between the perineum and the posterior aspect of the vaginal introitus healed by secondary intention; however, this did not cause esthetic or functional disability.

Table 2 The occurrence of complications after male-to-female gender reassignment surgery

Complication	No. of patients	% of all patients
Perioperative		
Perioperative rectal damage during preparation of the vaginal canal	2	1.5
Short term postoperative complications		
Bleeding from the stump of the shortened urethra	6	4.5
Temporary urinary retention	7	5.2
Healing by secondary intention	7	5.2
Long-term postoperative complications		
Stenosis of neovagina	7	5.2
Stenosis of neourethra	6	4.5
Folliculitis in a skin fold covering the glans of the neoclitoris	3	2.2
Urinary stress incontinence	2	1.5

In the first three patients (1.5%), clitoridoplasty was not performed. In a further 126 patients, clitoridoplasty was performed to create a vital neoclitoris. Among the 98 patients who were examined, the neoclitoris had erogenous sensitivity in 92 patients (93.9%), and 64 patients (65.3%) reached orgasm within the first 3 months after the first phase operation. During sexual stimulation, some patients produced a urethral secretion, which served as a natural lubricant.

Stenosis of the neovagina formed from penile skin was present in seven patients, none of whom were correctly performing sufficient autodilation in the postoperative period. Of these patients, two did not plan coital activities and five underwent sigmoideocolpoplasty. Three other patients were not satisfied with the proportions of the neovagina and also underwent rectosigmoid augmentation of the neovagina. Sigmoideocolpoplasty was performed in an additional five patients, whose primary surgery had been performed in other units. In one patient, the anastomosis between the sigmoid colon and vestibulum was stenotic and required dissection and repeated dilations. In total, 13 patients (9.7%) underwent sigmoideocolpoplasty. The sigmoid neovagina was continuously lubricated by intestinal mucus.

The external meatus of the neourethra was stenotic in six patients. In three patients, the stenosis was resolved by dilation; in three patients, dissection of the meatus and meatoplasty were required. Three patients underwent re-meatoplasty for incorrect direction of the flow of urine; micturition while sitting was enabled by the posterior shift of the meatus created by ventral meatotomy and marsupialization.

In total, 98 patients (73.1%) underwent the second phase of the operation (commissuroplasty). Three patients had repeated folliculitis in a skin fold covering the glans of the neoclitoris. In one of these patients, the anterior vulval commissure was dissected and the glans of neoclitoris was stripped. Two patients underwent corrective reduction labioplasty for the asymmetry of the labia majora when standing. Two patients reported urinary stress incontinence, one of whom required a long-term antimuscarinic medication.

Discussion

Surgical reassignment of the genitalia can be performed via a number of different approaches, with the aim of imitating the appearance and function of the organs of the opposite sex. Some of the functions of the original organs must be spared, some can be eliminated. The risks of surgery, including the risk to vital functions [19], must be carefully evaluated by the patient. The risks are those of general anesthesia, those posed by any surgical procedure (such as wound dehiscence, healing by secondary intention, and postoperative venous thromboembolic disease), and those specific to sex reassignment surgery (such as impairment of urinary continence, fecal continence, intestinal fistula, urinary fistula, and necrosis of the skin graft [20]).

Gender reassignment surgery carries a high risk of micturition problems including urinary stress incontinence and overactive bladder: a majority of the 18 patients reported by Kuhn et al. had a changed direction of the urinary flow [6] and problems with the flow of the urine occurred in one-third of the 232 patients described by Lawrence [21], but Hoebeke et al. found incontinence in only 16% of 31 patients following surgery [22].

Moreover, late complications may occur. The risk of vaginal stenosis of the inverted skin was estimated to be 29% by Stein [23]. This risk may be substantially decreased by repeated dilatations performed by the patient. However, actual stenosis of neovagina must be dilated very carefully because the danger of severe complications is increased in the scarred region. Liguori described a case of perforation of a neovagina formed from sigmoid colon after dilation of an introital stenosis, with subsequent peritonitis [24]. Another case report of a patient with severe fluor describes the finding of multiple concrements on metal clamp, closing the dead-end of sigmoid neovagina [25]. To prevent such complications, we used only resorbable material during all the phases of the surgery.

Another complication is neovaginal prolapse, which can be solved by fixation to the sacrospinous ligament. After opening the pararectal fascia on the right side, the pararectal space is entered and the ischial spine is palpated. A long-handled Deschamps ligature is used to pierce the ligament medial to the ischial spine. Vaginopexy to the sacrospinous ligament is performed, and the neovagina is placed deep in the perineal cavity [26]. We successfully treated one patient with neovaginal prolapse with this approach.

Hormonal treatment of patients with male transsexualism consists of estrogens, often combined with an anti-androgen (cyproterone acetate), before the sex reassignment surgery. The hepatotoxicity of estrogens can be minimized by transdermal application. Hormonal treatment can have adverse effects, most often thromboembolic complications [27].

Patients who have undergone gender reassignment surgery remain at risk of some male-related conditions, such as benign prostatic hyperplasia [28] or prostate cancer [29–31] because the prostate is left intact during the procedure. However, they gain significant benefits from having an appearance that corresponds to their sexual identification and does not cause them distress.

Surgical techniques have been evolving for 50 years. The main pioneers were Sir Harold Gillies in the UK [32] and Dr. Georges Burou (1910–1987) in Casablanca, who used a penile skin flap to form a neovagina in the 1950s and performed more than 800 vaginoplasties in transsexuals from all over the world [33]. Dr. Howard Jones from Johns Hopkins Hospital in the United States developed a second classic technique using a penile and scrotal flap [34,35]. The main problem with this technique is the presence of hair in the neovagina. The construction of a neovagina from a penile skin flap is now used worldwide as a standard technique for vaginoplasty in male transsexualism. Other techniques, employing rectosigmoid colon or local and distant skin flaps, are used only as second-line approaches [36]. Perovic et al. used a longitudinal flap of opened urethra inserted into a flap of penile skin to widen the diameter of the neovagina [37]. We used this technique in four patients and did not find any advantages compared to the classical approach.

The original Fang's clitoridoplasty [9] has been modified several times. Formation of a neoclitoris from a flap of glans with its dorsal neurovascu-

lar bundle, dissected together with the tunica albuginea [38], is simple and minimally hazardous to the structures of the bundle. We used this technique for some time but did not find any advantages compared to the above-mentioned anatomical dissection. Giraldo et al. used a symmetric, bifid flap from the corona of the glans designed in the shape of an open lotus flower for clitoridoplasty. To improve the cosmetic appearance of the vestibulum and avoid hair growth around the neoclitoris, a semicircular preputial flap was retained and attached to the flap of glans. To improve the cosmetic appearance of the vestibulum between the neoclitoris and the urethral neomeatus, a small dorsal flap of the spongiomucous urethra designed in the shape of a pencil tip was added [39].

It is crucial to know the opinion of patients when evaluating the cosmetic and functional results of the surgery. For example, in a study by Lawrence, patients responded positively but were less satisfied with vaginal lubrication and tactile and erotic sensory function [21]. The frequency of orgasm did not correlate significantly with patient satisfaction. Similarly, in a study where information was obtained from 28 of a total of 48 patients, overall satisfaction with the surgery was high, including satisfaction with the cosmetic result and the ability to reach orgasm [40]. Generally, evaluating results is made more difficult by the absence of controlled studies or studies collecting data prospectively, loss of contact with the surgeon in many cases, and a lack of valid evaluation criteria [41]. However, the majority of patients do not need surgical care after a successful procedure, and the success of their integration into society is a matter for research by sexual therapists.

Conclusion

Sex reassignment surgery represents an important phase of the treatment of transsexuals. An increasing number of patients undergo this treatment because of the extensive progress in surgery involving the genitals and urethra. For male transsexuals, surgery can provide a cosmetically acceptable imitation of female genitals (Figure 7) that enables coitus with orgasm.

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Figure 7 Usual appearance of the vulva after surgery.

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